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THE EFFECT OF KINDERGARTEN WORK ON THE EYESIGHT OF THE CHILDREN.*

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After several years' investigation of the methods employed by kindergartners, and after a careful study of the results obtained by them, I am much impressed by their extreme value. The public kindergartens, in this and other cities, not only do a work of incalculable value, but they often do it under the most disadvantageous conditions. Many a child, let us remember, finds in the teacher the only real mother that he ever knew or ever will know, and in the *garten* the only home that in after life he can look back upon with any sentiment of pleasure or satisfaction. I accordingly feel like apologizing for the criticisms that I am about to make of certain defects, judged from the standpoint of the ophthalmologist, that the kindergarten exhibits. It is in this spirit that I present my paper.

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The eyes of the infant are those of the savage—that is to say, they are adapted not for near vision, but for the distinct seeing of distant things. The structure of the eyeball, as well as of the other parts of the visual apparatus, indicates very plainly that quick perception of the images produced by objects lying without the immediate range has been considered, to the almost total exclusion of objects close at hand. This state of affairs persists in the individual almost without exception until extreme old age if, as child and man, he has led an outdoor life and has busied himself mostly with distant objects.

It would appear from the foregoing that however much we may have modified our other organs to suit our modern environment, we have not as yet evolved from a savage farsighted eye a shortsighted one that can be both safely and comfortably employed all day long in doing near work.

Even after a generation or two of civilization, those races that have been in a state of barbarism for many centuries resist the tendency that more civilized nations exhibit to change the original form of the eye. For example, of a hundred and four native New Zealand children of all ages, pupils in the Maori schools, only three per cent. were found to be myopic. Callan, of New York, examined four hundred and fifty-seven negro children between five and nineteen years of age; only 1.5 per cent. had become shortsighted in the primary grades, and less than 3.5 per cent. in the higher forms. The eyes of the Carlisle Indians were examined by Fox, of Philadelphia; only two per cent. of all grades were myopic.

On the other hand, Dr. Loring and Dr. Derby exam-

ined two thousand two hundred and sixty-five eyes of New York school children. Nearly one fourth of the pupils descended from German ancestors were myopic; one fifth of all the Americans were shortsighted, so were fifteen per cent. of the Irish scholars. Surely the shortsighted eye is the eye of civilization! In Dorpat, a few years ago, Koppe made a very careful examination of a large kindergarten and found not a single eye adapted for near work—they were all farsighted.

The hyperopia of the child is converted into myopia by a stretching of the eye coats, by enlargement of the whole globe, and by a consequent lengthening of the antero-posterior axis. If this abnormal stretching continues, as it often does, past a certain point, there is not only a reduction of vision through life, but certain destructive diseases of the ocular structures are produced or invited, many of them exposing the sufferer to partial or total blindness. This is, of course, apart from the pains, headaches, and general discomfort that attend this derangement of the vascular and other systems of the eye during the period of enlargement. Even when discovered and promptly treated, progressive myopia usually means anxious watching and frequent interruption of study, extending over the years that intervene between the commencement of the shortsightedness and the maturity of the myope.

But there is another condition of the savage or infantile eye that must not be overlooked, as it adds materially to the difficulties that the farsighted eye encounters in attempting to fix near objects. I refer to an improper *shape* of the eye, known as astigmatism, where the eyeball is not only too small—undeveloped if you like—but lacking in proper symmetry. Instead of being

rather spherical it has an oval form, especially in front. Rays of light from an object falling upon such an eye make a blurred image on the retinal screen, it matters not from what distance they are observed. This condition is not only an incentive to eye strain, with its accompaniment of headaches, blurred vision, and general discomforts, but is a common determining cause of myopia. A larger proportion of astigmatic children eventually become myopic than those that are hypermetropic only. Finally, a difference in the refraction of the two eyes (one eye more farsighted or more astigmatic than the other, or one eye hyperopic only and the other astigmatic) makes it more difficult for the child to see close at hand than in the distance.

I do not say that the farsighted or astigmatic child can not see minute objects near at hand—we all know he can; but he does so always as a result of some effort, sometimes conscious, sometimes unconscious. If he is a healthy child, with good eye muscles and a good ancestry, and has not too much hyperopia or astigmatism and does his near work under fairly good conditions of illumination, etc., he may pass joyfully through life without ever knowing much about his small degree of farsightedness. This near-seeing is accomplished by means of his power of accommodation, exercised through his focusing apparatus.

Observations made upon thousands of school children of all ages from four to twenty, by investigators in this country and elsewhere, demonstrate that, under the pressure of study principally, the eyeballs tend to elongate and increase in size in direct proportion (1) to the number of hours *per diem* they are employed at near work, (2) to the age at which this near work is begun, and (3)

to the disabilities (hyperopia, astigmatism, ill health, hereditary tendencies, poor light, and vicious habits) under which their studies are pursued.

Germany furnishes us with a fertile storehouse of facts touching this study of the eye defects of children. Let us look at some of the investigations made by observers in that country. For purposes of comparison the kind and amount of work have been divided into nine grades—the ninth being the most elementary with the fewest study hours—the first comprising the higher branches with a corresponding increase in the amount of near work.

Professor Cohn examined the eyes of 1,486 children attending the village schools of Silesia. They were not kindergarten children, and their hours of study during the year were comparatively few. The figures represent the percentage of myopia in each class.

IX			III	II	I
			1	2	3

He also examined twenty elementary city schools (4,978 pupils), where the requirements were slightly greater. As before, no myopia was discovered in the six highest forms, but the percentage in the three lowest was:

III	II	I
3	4	10

Among 834 pupils in young women's academies these were the proportions:

VIII	VII	VI	V	IV	III	II	I
1	2	7	8	6	16	12	19

The Friedrich's Gymnasium in Berlin (722 scholars) furnished this picture:

IX	VIII	VII	VI	V	IV	III	II	I
13	20	16	22	33	48	46	56	61

Of eleven thousand boy cadets of the Prussian army, twenty-five per cent. were found, on examination, to have all the grades of myopia.

As we know, American children furnish a better record, but I doubt whether the pupils of some of our schools are far behind the Vaterland in this particular.

Ellis examined two English primary schools. In one, with two hundred and fifty-five pupils, he found twenty-four per cent. of myopia; in another, eleven per cent. were myopic.

From France, Switzerland, and Russia comes the same story—the more prolonged the study hours and closer the work the more marked the eye defects when maturity is reached.

Another important fact in this connection is that children of myopic parents are much more likely to be shortsighted than are offspring of farsighted or emmetropic (normal-sighted) fathers and mothers. Still another and more ominous discovery made during the investigations I have just referred to is that the myopia in children of shortsighted parents is very prone to become excessive; hereditary myopia is the variety that furnishes the largest percentage of weak and useless eyes. These facts led Erismann to exclaim: "After a few generations every inhabitant of a European city will be a myope."

And so these figures might be multiplied indefinitely, warning us, in no uncertain tones, that as we increase the working hours of early school life we surely and inevitably increase the percentage of shortsighted and eye-strained scholars of later years; warning us that, so far as regards myopia, at least, the defective eyesight of the mothers and fathers will descend with increased emphasis

even to the third and fourth generation of those who injudiciously employ their farsighted eyes in gazing too early, too often, and too long upon minute and near objects.

The moral of my tale, so far as the kindergarten is concerned, may easily be drawn. I had a conversation in Heidelberg, a few years ago, with a distinguished Swiss ophthalmologist, himself an authority on this very subject, regarding the alarming prevalence of myopia in Europe. I said we were freer from it in America. "Just wait," said he, "until you have a few generations of kindergarten graduates, and until your boys and girls remain at school and college as long as ours do." I am, of course, waiting, but with a belief that school hygiene will yet prevail over this enemy of our national eyesight; and if you will permit me I shall briefly indicate the hygienic precautions that I would suggest to those of you who are especially interested in kindergarten work.

I repeat that my message is especially to kindergartners, because, as I have already endeavored to show, the beginnings of damaged eyesight are laid in the early years of school life; the prevention of the evil concerns chiefly, therefore, the kindergartner and the teachers in the lower forms, for the trouble is often past remedy when the pupil enters the high grades.

With this proviso, I would respectfully make the following suggestions:

1. Every kindergarten and every school should be provided with certain well-known and simple tests of vision, and no child of any age should receive instruction who has not good eyesight.

2. It should be a part of the teacher's duty—in the

public schools and in some private institutions the teacher is the only guardian (in any sense) that the child possesses—to note any defects of vision and have them corrected, if possible.

3. No child with uncorrected or incorrigible defects should be allowed to use his eyes for any kind of close work before he is eight or nine years of age, lest worse things befall.

4. In the kindergarten the children should be taught only those things that demand the minimum employment of the accommodation for near work. Froebel's "gifts" are sufficiently numerous and varied to enable both teacher and children to pass happy and profitable hours without damaging the precious inheritance of vision, and without inflicting defective eyes upon generations yet unborn.

5. Some kinds of instruction are in their nature unsuited for infants' eyes. I admire the work and teachings of such well-known authorities as Kate Douglas Wiggin and Nora Archibald Smith, and agree with them in many of their contentions. For example, I feel, with them, that it is questionable whether "children naturally incline to large movements in drawing," and that "they instinctively make pretty figures." I would certainly not allow them to engage in any kind of drawing, because the tendency always is, as with the grown-up folk, to indulge more and more in elaborate designs.

6. If one turns to the plates in the back of Josephine Jarvis's translation of Frederick Froebel's *Spiel und die Spielgegenstände der Kinder*, or to the elaborate designs affixed to many similar text-books on kindergarten study (Mrs. Rowland Hill's *Brush Work for the Kindergarten*, for example), it will not be difficult to eliminate those

occupations and studies that are palpably inimical to the eyesight of the child.

7. Speaking broadly, Froebel's first four "gifts," and the uses to which they are ordinarily put in the kindergarten, and the occupations to which they may give rise, are mostly devoid of harm, so far as the eyes are concerned. They also suggest many *Mutter-* and *Kose-lieder*, the use of which in kindergarten work is so much to be commended and leaves so little to be criticised that I sometimes ask myself whether with balls and blocks and the accompaniment of song and play kindergarten children might not be made to undergo a healthier development than that which the more complex and elaborate occupations subserve.

8. Above all do I deprecate certain occupations commonly recommended by and pictured in most of the latest kindergarten text-books. These are perforating cards, embossing, fine sewing, drawing in all its forms and phases, most kinds of paper interlacing, intricate paper cutting and folding, peas work, clay modeling, chain making (except where the links are very large), bead stringing, etc. These practices, however little indulged in, are almost certain to damage the eyesight of kindergarten children.

9. Among the less hurtful occupations—some of them harmless—are games not involving near work to any extent, slat interlacing (with wide slats of well-contrasted colors), sand work (especially if indulged in as German children use it—out of doors), gardening, that Froebel loved so well, building with large blocks, and the occasional use of simple apparatus, like Putnam's "busy work tiles."

My plea, therefore, is for work that one connects

with a real garden—a genuine child's garden. This would be particularly appropriate in the case of American children, who, living in our stimulating climate and in our stirring times, need to have their physical well-being above all things considered. Plenty of air and sunshine, a minimum of instruction, a maximum of natural enjoyment—these I would have in every kindergarten. The lessons that children love to learn from real plants and some animals and many products of the animal, vegetable, and mineral worlds—all these I would teach from samples kept in stock. But the use of the eyes upon fine work of any kind, as well as their employment for more than a few minutes' duration upon any sort of near occupation, I would absolutely forbid. These sanitary precautions may not mirror the letter of Froebel's teachings, but in my opinion they reflect the spirit of the master. After all, in his own words:

"Was kann lieblicher sein
Als des Kindes kindliches Spiel?"